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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/616,623

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Aiguo Lu

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3364

7590

10/19/2005

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EXAMINER

KIK, PHALLAKA

ART UNIT

PAPER NUMBER

2825

DATE MAILED: 10/19/2005

Please find below and/or attached an Office communication concerning this application or proceeding.



## Office Action Summary

Application No.

10/616,623

Applicant(s)

LU ET AL.

Examiner

Phallaka Kik

Art Unit

2825

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 7/10/2003, 4/26/2005 and 10/11/2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 10-14 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,6 and 15 is/are rejected.
- 7) ☒ Claim(s) 2-5,7-9 and 16-20 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input checked="" type="checkbox"/> Interview Summary (PTO-413)          |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)               | Paper No(s)/Mail Date. <u>20051014</u> .                                    |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>7/10/03, 4/26/05</u> .  | 6) <input type="checkbox"/> Other: _____.                                   |



### DETAILED ACTION

1. This Office Action responds to the Application filed on 7/10/2003, IDS filed on 4/26/2005 and 7/10/2003, and interview conducted on 10/11/2005. Claims 1-20 are pending, wherein claims 10-14 are withdrawn from consideration as being drawn to non-elected invention with traverse, as given below.

### *Election/Restrictions*

2. Restriction to one of the following inventions is required under 35 U.S.C. 121:

- I. **Claims 1-9,15-20**, drawn to method/computer useable medium for estimating clock uncertainty between a receiving cell and a launching cell of a net, classified in class 716, subclass 6.
- II. **Claims 10-14**, drawn to a process of optimizing a clock net in the form of a tree, classified in class 716, subclass 10.

3. The inventions are distinct, each from the other because of the following reasons:

Inventions II and I are related as combination and subcombination. Inventions in this relationship are distinct if it can be shown that (1) the combination as claimed does not require the particulars of the subcombination as claimed for patentability, and (2) that the subcombination has utility by itself or in other combinations (MPEP § 806.05(c)). In the instant case, the combination as claimed does not require the particulars of the subcombination as claimed because the clock net optimization of invention II can use timing calculation other than that of invention I. The subcombination has separate utility such as providing clock uncertainty calculation for timing related circuits placement/routing other than that of invention II.



4. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

5. During a telephone conversation with Timothy Croll (Reg. No. 36,771) on 10/11/2005 a provisional election was made with traverse to prosecute the invention of Group I, claims 1-9,15-20. Affirmation of this election must be made by applicant in replying to this Office action. Claims 10-14 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

6. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

#### ***Specification***

7. The abstract of the disclosure is objected to because of the following informalities:

"character" (line 8) should be --characteristic-- for proper spelling and conformance with Applicant's disclosure (see page 4, lines 9-19 of Applicant's specification);

"first" (line 12) should be --second-- for conformance with Applicant's disclosure (see page 4, lines 9-19 of Applicant's specification);



"predetermined marked cell" (lines 10 and 12) should be --marked cell having the predetermined characteristic-- for greater clarity and in conformance with Applicant's disclosure (see page 4, lines 9-19 and Fig. 4 of Applicant's specification).

Correction is required. See MPEP § 608.01(b).

***Claim Objection Under 37 CFR 1.75***

8. Applicant is advised that should claim 17 be found allowable, claim 19 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof, wherein "computer readable code for causing the computer to identify a second clock delay between the clock source and the receiving cell" is already recited in claim 16, from which both claims 17 and 19 depend, and the remainder of the limitations are both recited in claims 17 and 19. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

***Claim Objections***

9. **Claims 1-9,15-20** are objected to because of the following informalities:

As per **claims 1**, "a predetermined marked cell" (lines 10 and 12-13 respectively) should be --one of said each marked cell having a predetermined characteristic-- to clearly identify that the predetermined marked cell is the same cell marked in step (a) (lines 4-7 and 6-10 respectively) as disclosed in Applicant's specification (see page 4, lines 9-19 of Applicant's specification); "first" (lines 12 and 16 respectively) should be --second-- to provide for the missing essential structural/functional relationship among the



elements of the claims and to also conform to Applicant's disclosure of the invention (see page 4, lines 9-19 and Fig. 4 of Applicant's invention). For examination purposes, it is assumed that "predetermined marked cell" can be the same or different from the "cell" marked in the marking step, and step (c) (lines 11-13 and 14-17 respectively) is based on the "first" path as presently claimed.

As per **claims 3,5,8,9,17,19**, "predetermined" (lines 3 and 5 respectively) should be deleted for conformance to corrections of claim 1 above, from which the claims depend.

As per **claim 6**, "the maximum" (line 10) should be --a maximum-- for proper antecedent basis.

As per **claim 7**, "the launching and receiving cells are data launching and receiving cells, " (lines 1-2) should be deleted since this limitation has already been recited in claim 6 from which the claim depends.

As per **claim 20**, "the launching and receiving cells are data launching and receiving cells and " (lines 2-3) should be deleted since this limitation has already been recited in claim 16 from which the claim depends.

As per **claims 2-9,15-20**, the claims are also objected to for incorporating the above errors into the respective claims by claim dependency.

Appropriate correction is required.

***Claim Rejections - 35 USC § 103***

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:



(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. **Claims 1,6,15** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Spyrou** (US Patent No. 5,608,645) in view of **Chen et al.** (US Patent No. 5,835,751).

As per **claims 1,15**, **Spyrou** discloses the calculation of the clock uncertainty (i.e., clock skew which is also known in the art as clock uncertainty--see other prior arts discussed in conclusion section) based on the delay associated with a path (i.e., first path) between a marked cell (or specified instance) and the receiving cell (i.e., with respect to instances which could be two storage elements instances connected by the path--see Fig. 1; see col. 2, lines 15-39, wherein a launching cell corresponds to the source data storage instance and the receiving cell corresponds to the destination data instance as further described in col. 9, lines 21-46), including the tracings (i.e., traversal using the depth first search) of the first path and second path (see col. 6, line 66 to col. 7, line 10), wherein the marked cell or marking of the cell could correspond to the specified instance under consideration or the delay information being extracted or marked to the particular cell instance. However, **Spyrou** failed teach that these tracings are performed backward (i.e., back-tracing) as claimed. **Chen et al.** teach the use of backward tracing to identify the clocking paths, including the use of marking to reduce the amount of time to traverse through the paths (col. 8, lines 36-60), as part of the clock timing analysis (Figs. 4 and 5). It would have been obvious to one of ordinary



skilled in the art at the time of the invention to modify the tracings of **Spyrou** such that they are performed backward from the launching/receiving cells toward the clock source as taught by **Chen et al.** because such modification would allow the clocking paths of **Spyrou** to be identified quicker by reducing the amount of time traversing through the unnecessary paths as taught by **Chen et al.** (see col. 8, lines 36-60).

As per **claim 6, Spyrou** in view of **Chen et al.** disclose all of the elements of claim 1, from which the claim depends, as discussed above, wherein since **Spyrou** also describes the repetition of the steps (b) and (c) for each launching cell (i.e., source storage instance) (col. 7, line 35 to col. 9, line 58) to derive the clock uncertainty having the maximum value of the clock uncertainties obtained (i.e., worst case clock skew shown in equation on col. 9, line 10, as a function of data source clock arrival minus clock arrival time, derived for the worst case timing path).

***Allowable Subject Matter***

12. **Claims 2-5,7-9,16-20** are objected to due to the noted informalities set forth in this Office Action above and as being dependent upon a rejected base claim, but would be allowable if the claims are rewritten to overcome the noted informalities and if claims 2,5,7,9,16 are rewritten in independent form including all of the limitations of the base claim and any intervening claims.

13. The following is a statement of reasons for the indication of allowable subject matter:

As per **claims 2-4,7-8,16-20**, claims 2, 7 and 16, from which the respective claims depend, recite the inventive features of calculating the clock uncertainty if the



slack does not exceed a predetermined value, in combinations with the steps/computer readable code for identifying the first clock delay, the second clock delay, the data delay and for calculating the slack, as part of the process/computer readable medium for estimating clock uncertainty between a receiving cell and a launching cell of a net, involving the back-tracing steps/computer readable code, as claimed, which the prior arts made of record failed to teach or suggest. In particular, although in **Spyrou**, the smallest critical weight and worst case timing delay are repeatedly calculated involving the use of slacks and skews (see col. 7, line 35 to col. 9, line 47) in which there are a plurality of clock signal paths existing between a given clock input and a given instance and in which there are a plurality of clock inputs existing for a circuit layout, **Spyrou** fails to teach or suggest the inventive features as claimed. Other prior arts made of record, alone or in combination of the prior arts made of record, similarly failed to teach or suggest the inventive features as claimed. Accordingly, the claimed invention is novel and un-obvious over the prior arts made of record.

As per **claims 5,9**, the claims further recite the inventive steps of calculating the clock uncertainty based on the second clock delay and the common clock delay, as claimed, in combination with steps (a)-(c) as claimed, as part of the process of estimating the clock uncertainty between the receiving cell and the launching cell of a net, as claimed, which the prior arts made of record failed to teach or suggest. Although the building of common tree is taught in **Chen et al.** (see especially col. 10, lines 21-28; col. 12, lines 16-47), **Chen et al.** failed to teach or suggest the inventive steps as claimed. Other prior arts made of record, alone or in combinations, similarly failed to



teach or suggest the inventive steps as claimed. Accordingly, the claimed invention is novel and un-obvious over the prior arts made of record.

### ***Conclusion***

14. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. In particular, the following prior arts made of record are most relevant:

**Camporese et al.** (US Patent No. 6,311,313, especially col. 1, lines 25-52) teaches that clock uncertainty is a component of clock skew.

**You et al.** (US Patent Application Publication No. 2004/0123259, especially paragraph [0086] and Fig. 10) teaches the derivation of worst case clock skew and making use of it so that only possible timing violation paths are considered.

**Feehrer** ("The Effect of Propagation Delay Uncertainty on the Speed of Time-of-Flight Digital Optoelectronic Circuits", Journal of Lightwave Technology, Vol. 14, No. 12, pp. 2698-2713, December 1996, especially sections 5A, 5B, 5C) teach the calculation of uncertainty using backward traversal to clock source.

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phallaka Kik whose telephone number is 571-272-1895. The examiner can normally be reached on Monday-Friday, 6:30AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew S. Smith can be reached on 571-272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.



Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

**Any response to this action should be mailed to:**

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Alexandria, VA 22313-1450

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571-273-8300



Phallaka Kik  
U.S. Patent Examiner  
October 15, 2005